

Campsicnemus fumipennis Parent (Diptera, Dolichopodidae)¹

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(Presented at the meeting of November 4, 1937)

Carved out of the leeward slope of precipitous Konahuanui, Koolau's highest summit, the little Lulumahu Canyon upstream from the wild narrow leap of its waters into Nuuanu Valley follows at first a relatively straight course. At the upper end of this stretch a short distance before the canyon winds its tortuous diminishing way into the heart of the mountain mass a small close-set grove of tall banana plants—one of many such to be found in faraway places in Hawaiian mountains—clings to a steep slope right beside a waterfall. Within this grove the sunlight penetrates none too strongly, often there are deep shadows and always it seems dank, for we are at an elevation of nearly 2,000 feet, in a region of frequent mists and heavy rainfall, the mossy forest of the tropics. All around, the low trees, the shrubs and much of the soggy forest floor are clad in moss, liverworts and fern, but the tall stems of the bananas save for a scant drapery of their own withered leaves stand forth nakedly though interrupted in their smoothness by outer sheathings that are dead and drying. Underfoot there is an admixture of rock, mud, decaying plant tissue and dripping green banks. And more or less intermingling with the bananas are lesser plants often with succulent leaves and brittle stems—the rambling fiber plant or *olona* (*Toucharia latifolia* Gaud.; Urticaceae), a tangled growth of the shrubby dark-leaved *Cyrtandra paludosa* Gaud. (Gesneriaceae) invading the grove, a more herbaceous *Cyrtandra* being less common while one of the numerous representatives of the genus *Peperomia* (Piperaceae) grows close to the earth. Of note also is the curious fern *Polypodium spectrum* Kaulf. with erect ivy-leaf like fronds from a rhizome that creeps along the ground or nearby in the forest, ascends some mossy limb.

Various insects and other invertebrates flourish in this damp shady grove. A close study of its fauna would yield a long list. Some of the forms may be noted here. Obvious enough is a flatworm or planarian *Geoplana* sp.,² dark, slimy and somewhat over an inch in length that glides along, its pointed head often raised from the ground in search of prey. Such a flatworm was once seen to attack and overcome a small oligochaete earthworm that was greatly agitated; elsewhere it was observed feeding in numbers on a large

¹ Parent, O., Konowia, XVI, pp. 76-77, fig. 10, May, 1937.

² Dr. L. H. Hyman of the American Museum of Natural History has kindly undertaken to work out this species upon the receipt of better material.

earthworm that lay exposed on a mountain trail. This planarian also successfully entangles in its slime small Crustacea such as *Orchestia* and other invertebrates. *Succinea* snails with shell perched caplike on relatively large body, the delicate zonitid *Philonesia* near *baldwini* Ancey³ encased in its flattish almost transparent pale brown shell, the tiny *Tornatellides*, probably *procerulus* Ancey³ and an immigrant slug occur on leaf and stem, while an aquatic snail *Lymnaea* sp.³ of foreign origin, abundant in the nearby stream is found also about the boggy floor of the grove. Among the Crustacea both the depressed or isopod and the compressed or amphipod forms occur, the leaping *Orchestia platensis* Kroyer climbing well up on plants, while a sowbug *Philoscia angusticauda* Budde-Lund and a much smaller form are also abundant. Two or more species of small centipedes, one a common lithobiid, conceal themselves in suitable places, while of millipedes the rather flattish inch-long *Orthomorpha gracilis* Koch is conspicuous on the ground and on banana stems. Spiders and mites are more or less apparent. Tiny indeed though not inconspicuous as they move about on banana plants are whitish collembolans. At least one of these primitive soft-bodied insects is of a variety with elongate antennae and, on provocation all leap vigorously. *Saldula* or "shore bugs" range throughout this humid region. The earwigs *Anisolabis eteronoma* Borelli and *Labia dubronyi* Hebard are present among decomposing stems. The damselfly *Megalagrion hawaiiense* (McLachlan) may be started yet pallid and weak-flying in its newness from near its nymphal shell on a banana stem; dark, fully matured individuals flit and rest among the shadows or engage in inserting their eggs in a dripping mossy bank. And occasionally we find nymphs of this species in various instars, on a banana stem, for the insect is scarcely more than semi-aquatic. A fungus midge breeds in decaying banana tissues while other tiny midges, as *Forcypomyia ingrami* Carter, hover in small swarms. The curious *Forcypomyia* larva creeps about soggy sun-sheltered plant materials. Long-legged crane flies or Limnobiidae, mostly *Limonia grimshawi* (Alexander) fly out of concealment from among dead banana leaves, the old stems supplying food and shelter for its larva. The big brisk soldier fly *Neoexaireta spinigera* Wied. of Australian origin as well as the widespread smaller species *Cephalochrysa hovas* Bigot breed in dead banana tissue. Here also flourishes the common syrphid fly *Syritta oceanica* Macq. Eleven species of drosophilid flies were taken in this banana grove. Some of these are handsome picture-winged species. The determinations⁴ are as follows: *Drosophila immigrans* Sturt., *D. melanogaster* Meig., *D. sp.* near *melanosoma* Grims., *D. sp.* near *carinata* Grims., *D. 2 spp.* near *paucipuncta* Grims., *D. sp.* near *cognata* Grims., *D. lulumahu* Bryan, *D. deltaneuron* Bryan, *Idiomyia*

³ Determined by Dr. Montague Cooke, Malacologist at the B. P. Bishop Museum, Honolulu.

grimshawi Bryan and *I. oahuensis* Grims. Some of the drosophilids were attracted to bunches of bananas, that were often badly eaten by rats. Of muscoid flies a handsome *Prostethochaeta* near *lucilioides* Grims.,⁴ with a shining blue abdomen, as well as the predacious *Lispocephala ingens* (Grims.) with polished brown body were occasionally found about decayed banana stems. Examining fallen banana stems revealed one or more carabid beetles and carabid larvae rather uncommon, *Osorius rufipes* (Motsch.) (Staphylinidae), *Dactylosternum subquadratum* Fairm.—adults and larvae—*Cercyon quisquilius* (Linne) (Hydrophilidae), and *Polytus melerborgi* (Boh.) (Curculionidae).

Now, as we look again among the banana stems an alert brown fly suddenly alights before us (Fig. 6, male). In profile showing a body well raised on long strong legs it is able to survey a fairly extensive if very steep environment. Although not overwary it was surprising—before the writer developed a more cautious technique—how often it managed to get out from under the large vial descending overhead to imprison it. Seeming much to prefer shade to sunshine, it frequently rests quietly on a stem but is more commonly observed progressing in little exploratory runs, with very brief halts, going chiefly upwards, sometimes to one side or more rarely downwards. It may “about face” with great rapidity when something attracts it from the rear. Collembolans seem to form the chief food of this fly and, upon discovering a suitable one of these tiny insects—for the larger specimens do not appear to be as acceptable—the fly immediately follows close behind and at an opportune moment stoops very quickly to seize it in its bristle-rimmed tongue or labella.

While *Campsicnemus fumipennis* measures but a scant 4 millimeters in length of body it is the largest species of the genus thus far discovered in Hawaii. It comfortably exceeds in size the sooty black *C. miritibialis* Van Duzee, one of our next largest *Campsicnemus* and that at the time of these field studies might have been observed skating in swift graceful curves in shallow pools of the stream not a stone's throw away. The color of *fumipennis* is pale brown with two black stripes on the middle of the thorax, much blackish on its posterior part and obscuring bands predominating on the abdomen. The wings are somewhat infuscate chiefly along veins of the middle and apical fields (Fig. 5). The male bears two rows of long erect bristle-like hairs on the middle tibiae and one row on the middle femora.

This species was described from a single female taken on November 29, 1933, near the Moaula stream at 2,100 feet elevation in the mountains of east Molokai Island. My observations on its habits in the particular banana grove in the mountains behind Hono-

⁴ Determined by E. H. Bryan, Jr., curator of collections at the B. P. Bishop Museum, Honolulu, who describes the new Drosophilidae in the present issue of the Proceedings.

lulu and a single observation in a similar grove in the Kaluanui Valley on windward Oahu at an elevation of about 2,000 feet show that it is predominantly arboreal in the adult stages.⁵ It favored particularly the stems of bananas, ascending them rarely if ever to the crown. When it had completed an exploration it would fly lower down on the same stem or to another stem, or would alight on one of the withered banana leaves hanging near at hand and there renew its investigations. Occasionally one would fly to a small much decayed banana stump that lay nearby, chiefly along the ground and in which a few small dolichopodid larvae were later found, but which, however, may have been those of one or two small brown *Campsicnemus* species, as yet undetermined, that patronized this stump, the ground⁶ nearby, and that not infrequently ventured well up a banana stem. More rarely was *C. fumipennis* found on the slender stems of *olona* in this Lulumahu banana grove.

But fragments of the life-history of this rather uncommon fly are to be gathered in its often inhospitable mountain home.⁷ It occurs throughout the year, the males seeming to predominate. One morning in March 1937, a recently issued male, its wings still pallid and the body quite delicate was very readily captured from the extremity of a dried bit of banana stem that protruded upwards from a stump some 8-10 inches tall. A few days later a male and a female *C. fumipennis* were observed alongside a decaying portion of a standing banana stem. Some of this decaying portion was cut off and soaked in water in the laboratory thus revealing one small and another well-grown dolichopodid larva, two anthomyiid larvae probably those of *Lispocephala*, a number of *Limonia grimshawi* crane-fly larvae, etc. The larger dolichopodid larva contained in its alimentary canal chitinized fragments of insects quite unrecognizable except for the head capsule of what appeared to be a psychodid fly larva. Captive *C. fumipennis* were induced to oviposit on decaying banana stem tissues, the eggs being barely imbedded in the somewhat translucent material. They are more pointed at one end, polished, amber yellow and about 0.54 mm. long (Fig. 1). They develop rapidly so that in a few days the young larva may be seen within, its head-frame a black spot with some parallel rods therefrom, becoming very apparent. It soon cuts a slit from the more pointed end of the egg down to about its middle length where it ends in a curve, and slips out of the shell. A few of the larvae were reared to a considerable size and one successfully pupated and produced an adult. The method employed in rearing consisted in placing

⁵ On May 8, 1938, a female *C. fumipennis* was taken on the stem of a solitary banana plant in a narrow ravine at the base of Mt. Kaala, Waianae Mts., Oahu.

⁶ The large *Dolichopus exsul* Aldrich is also on the wet ground here.

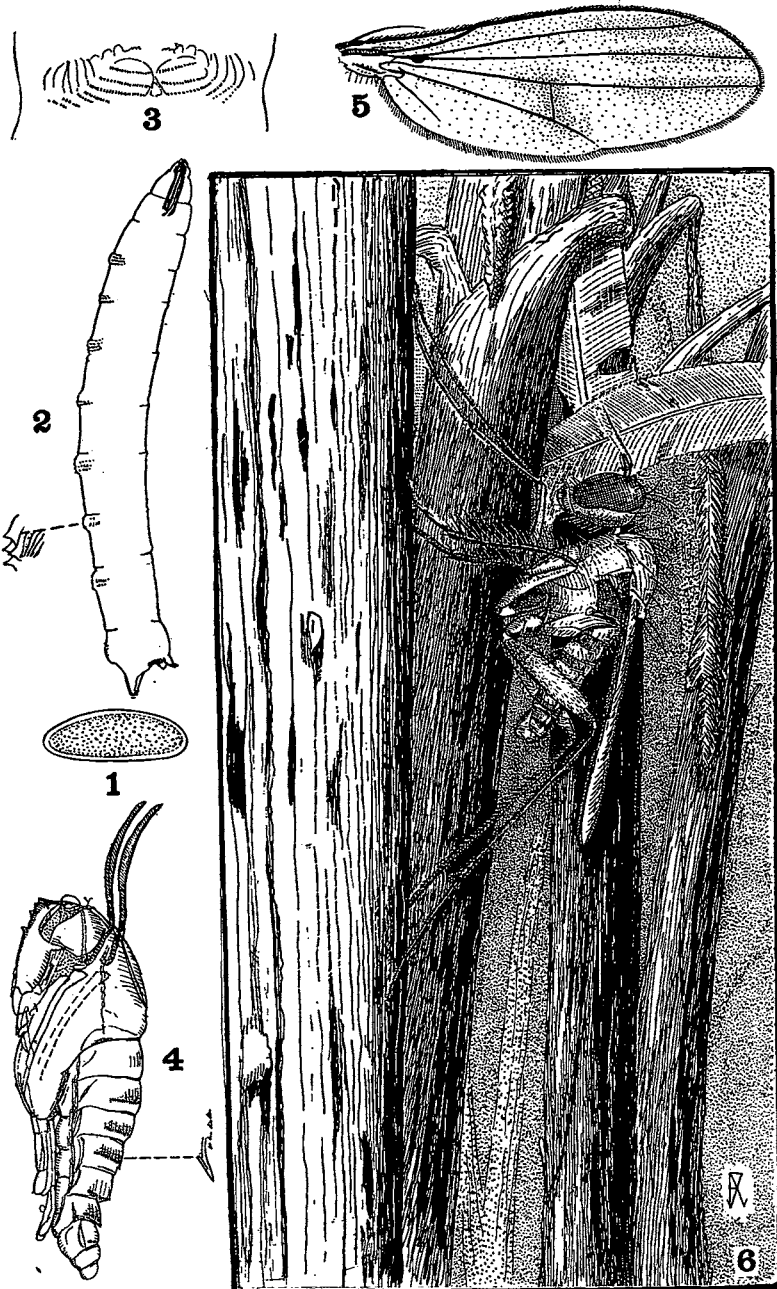
⁷ Sixteen trips—from September 1936 to September 1937—were made to the mountains to study this fly.

a mass of decayed banana stem tissue on and partly into wet sand in a large glass receptacle and adding two or three decaying guavas (*Psidium guajava* Linn.). Some common pomace flies (*Drosophila melanogaster*) were then placed in the receptacle and finally several female *Campsicnemus fumipennis*. The drosophilids attracted to the decaying fruit in which they commonly breed, would oviposit thereon, the resulting maggots thus presumably serving as food for the predacious *C. fumipennis*. In this manner, placing the dolichopodid in such a receptacle on February 21, 1937, I secured by March 23, the single cocoon that on April 1 disclosed an adult female. The somewhat glassy *C. fumipennis* larva finally attains a length of about 7 mm. It is of the usual dolichopodid larva form (Fig. 2), tapering at the fore end and truncated and lobed at the posterior. Anteriorly the stigmata are very small; the posterior pair are well separated and surrounded by 4 lobes bearing small hair fans that help maintain a passage way in the wet material in which it lives. On the anterior ventral side of segments 5-11, and nearly on the middle length of segment 12 which bears the anal aperture, are low paired protuberances bearing curved rows of teeth of about the same color as the derm proper of which they are a part (Fig. 3). These tooth or spine rows aid in locomotion, and their nature and arrangement are important in the classification of the Dolichopodidae as well as of other groups of fly larvae. The cocoon is short oval and composed of a tough gelatinous material binding in this case, grains of sand. Through the fore end of the cocoon protrude the two slender respiratory horns of the pupa that can be made to converge or diverge to some extent. When emerging time is at hand the active pupa thrusts itself through the cocoon—and entirely free of it in the one case observed—to liberate the fly through fissures that form chiefly along the back between the respiratory horns and across the top of the head. The pupal shell is about 4 mm. long exclusive of the respiratory horns which are an additional 1.5 mm. It is a light yellowish brown, but darker on the front of the head, a band on the horns near their base, and along the spine-row area on six dorsal abdominal segments. There are three stout pointed processes beginning from the apex of the head and a fourth and paired one lower along the face. There is a bristle on each side of the apex, several pairs of

CAMPSICNEMUS FUMIPENNIS

Explanation of Plate X

1. Egg. Length 0.54 mm.
2. Larva—probably in last instar; side view. Length about 7 mm.
3. A pair of abdominal prolegs of larva showing arrangement of spine-like processes. Ventral view.
4. Pupal shell, female. Side view. Length exclusive of respiratory horns, 4 mm.
5. Wing of female.
6. The fly in its natural environment. Length from head to end of body, 3.75 mm.



fine spine-like processes along the dorsum of the thorax and a row of stout spines across the back of abdominal segments 2-7, with many stout spinules intermingled and anterior to them. The respiratory horns are somewhat flattened except at their base and are broadest at the middle. From near the base of this wide part of each horn, a line of dots—probably breathing pores—commences and extends to, and for a short distance hook-like over, their extremity.

From time to time a tall stalk having yielded its cluster of fruit and buffeted perhaps by sudden wind or loosed by winter flood, falls to earth, the young shoots about its base striving among themselves for the space and light thus released. And so the banana grove in its growth and in its decay supplies a convenient and sometimes a necessary shelter and sustenance for a number of insects and other invertebrates that are gathered beneath its shadows. And of all such tiny creatures none seems more at home there than the alert, smoky-winged *Campsicnemus* fly.

***Asyndetus carcinophilus* Parent (Diptera, Dolichopodidae)¹**

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The entrance to the holes of the common ghost crab (*Ocypode ceratophthalma* [Pallas]) of our sandy beaches is a favorite resort of several species of flies. Largest and most conspicuous of these is *Asyndetus carcinophilus* (Pl. XI, 1), a rather bristly, white-bearded fly, the generally grayish color of which is varied by reflections of greenish and bronzy. Here it finds shelter from the glare and heat of the sun as well as from cooling winds. Not venturing more than a few inches within these burrows, but stationing itself rather at the very entrance of relatively large and often abandoned ones this wary insect is able to dart out to safety at one's approach. When the danger is over it will work its way back to the selfsame or to another crab hole. Higher up on the beach the fly is also found where there are suitable depressions. Other flies, all of small size, that were observed at or near the entrances to the burrows of the *Ocypode* crab were: a grayish agromyzid, the rather similarly colored ephydrid, *Hecamede persimilis* Hend.,² an occasional dark shining species as yet undetermined but apparently also an ephydrid, a borborid, and quite rarely the very swift empid *Chersodromia hawaiiensis* Melander—described in this issue. *Asyndetus* was not

¹ Abbé O. Parent is describing this and several other species of Hawaiian Dolichopodidae.

² Determined by E. T. Cresson, Jr.

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